



# THE OHIO STATE UNIVERSITY

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## Pumpkin Powdery Mildew Fungicide Demonstration Trial Report - 2024

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### Introduction

A powdery mildew (PM) fungicide evaluation trial was conducted on pumpkin at the Western Ag Research Station in South Charleston, OH at 39.857672, -83.667513. All treatments were applied to a powdery mildew susceptible hybrid (Pik-a-Pie) to determine the impact of fungicides alone to reduce infestation on plant foliage. No yield data was taken.

This goal of this powdery mildew demonstration trial is to evaluate fungicide programs and assess the effectiveness of a **primary** fungicide (typically the first compound applied) in combination with recommended rotational fungicides (typically the second compound(s) applied).

These fungicide programs have been designed to primarily manage powdery mildew and have inherent weaknesses against specific diseases such as downy mildew, bacterial and soil borne diseases. If downy mildew should be detected in the trial, fungicides specific to downy will be applied across the entire trial to prevent this disease from impacting the PM ratings.

The upper leaf surface is easier to protect with fungicides and typically has lower levels of powdery mildew infestation, therefore this report focuses primarily on how well the lower leaf surface is protected by each treatment. The spray application technology used to apply these compounds follows standard university recommendations, therefore compounds that are inherently contact or systemic in nature will be delivered to the target (leaf foliage) in the same manner.

Generally speaking, 2024 was a much drier than normal year at the station, with precipitation totals for June, July, August and September at 1.7", 2.8", 2.2" and 3.8" respectively.

### Plot Installment

The trial was direct seeded May 31 using a Monosem vacuum planter. Each treated plot consisted of one 85' long row of hybrid Pik-a-Pie pumpkin (powdery mildew susceptible) with three Jack of Hearts (powdery mildew tolerant) pumpkins transplanted at the end of each row. Each row was thinned to a final stand of 3-4' between plants. Fifteen feet on the east side of each

plot was not sprayed and served as an “untreated check” section to confirm the presence of powdery mildew (PM).

Treated plots were separated by a 15’ drive lane on each side with a 20’ fallow buffer between the header and end of each plot to minimize spray drift between plots. The seeds were treated with FarMore FI400 to limit striped cucumber beetle seedling feeding to minimize transmission of bacterial wilt.

Weeds were managed in the trial by spraying Strategy (4.5 pints/A) plus Dual Magnum (1.3 pints/A) plus glyphosate (48 oz/A) pre-emerge May 31. Shielded spray applications of Sandea (1 oz /A) plus glyphosate (48oz/A) was made June 27<sup>th</sup>. Any major weed escapes were hand pulled or hoed out weekly. The prior crop was soybean.

Based on soil test results, no P or K was added to the field. On June 28, 75 pounds of nitrogen in the form of liquid 28-0-0 was side dressed six inches away from each row, approximately two inches deep in the soil.

## Treatments

The fungicide programs evaluated for powdery mildew control (Table 1) will be referenced by their main attributes throughout the report. Treatment 10 was created by examining two leaves from each untreated plot area representing treatments 1-9, for an average of 18 leaves per rating.

**Table 1.** Powdery mildew fungicide trial treatments, rates per acre, FRAC and manufacturer.

TRT	Product, Rate, FRAC Sprays 1, 3, and 5	Product, Rate, FRAC Sprays 2, 4, and 6**
1*	MilStop 2.5 lb/31 gallons [FRAC NC] (Do Not Add NIS, Bioworks)	Quintec 6 fl oz + Manzate Pro-Stick 2.5 lb [FRAC 13 + M] (Gowan, UPL)
2*	MilStop 5.0 lb/31 gallons [FRAC NC] (Do Not Add NIS, Bioworks)	Quintec 6 fl oz + Manzate Pro-Stick 2.5 lb [FRAC 13 + M] (Gowan, UPL)
3*	MilStop 3.0 lb/31 gallons [FRAC NC] (Do Not Add NIS, Bioworks)	Cease 4 qt + NIS [FRAC BM02] (Bioworks)
4*	Gatten 6.4 oz [FRAC U13] (Nichino)	Cease 4 qt + NIS [FRAC BM02] (Bioworks)
5*	Switch 14 oz [FRAC 9,12] (Syngenta)	Quintec 6 fl oz + Manzate Pro-Stick 2.5 lb [FRAC 13 + M] (Gowan, UPL)
6*	SiGuard L 32oz (ISP Tech)	Quintec 6 fl oz + Manzate Pro-Stick 2.5 lb [FRAC 13 + M] (Gowan, UPL)
7*	SiGuard L 48oz (ISP Tech)	Quintec 6 fl oz + Manzate Pro-Stick 2.5 lb [FRAC 13 + M] (Gowan, UPL)
8*	Procure 8 fl oz + Vacciplant 14oz [FRAC 3 + M] (UPL)	Quintec 6 fl oz + Manzate Pro-Stick 2.5 lbs [FRAC 13 + M + P4] (Gowan, UPL)
9*	Switch 14 oz [FRAC 9,12] (Syngenta)	Cease 4 qt + NIS [FRAC BM02] (Bioworks)
10	Untreated Check	

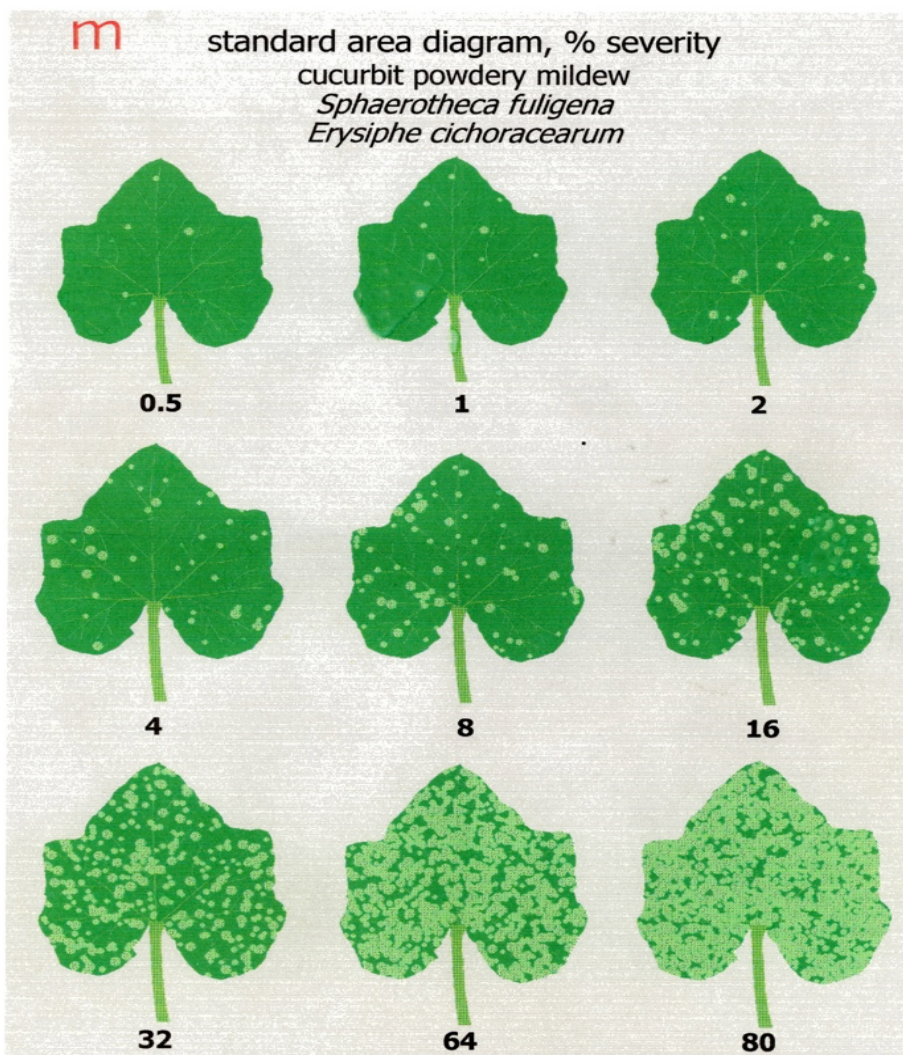
\*All sprays include Improve NIS @ 0.125% (0.00125 v/v)

\*\*Application #6 was Quintec 6 fl oz + NIS for all plots.

## Ratings & Application

Powdery mildew was first detected at a very low level in the trial July 18. Plot treatments were rated for percent PM infestation between 10am and noon on July 18, 25; August 5, 12, 20; September 9. The gap between the 5<sup>th</sup> and final rating was due to me being out of the country during this period. Fungicide treatments were applied between 1-4pm on July 19, 26; August 5, 12, 20 and 28. All treatments were applied using a hydraulic boom sprayer at 31 GPA using hollow cone nozzles at 65 PSI.

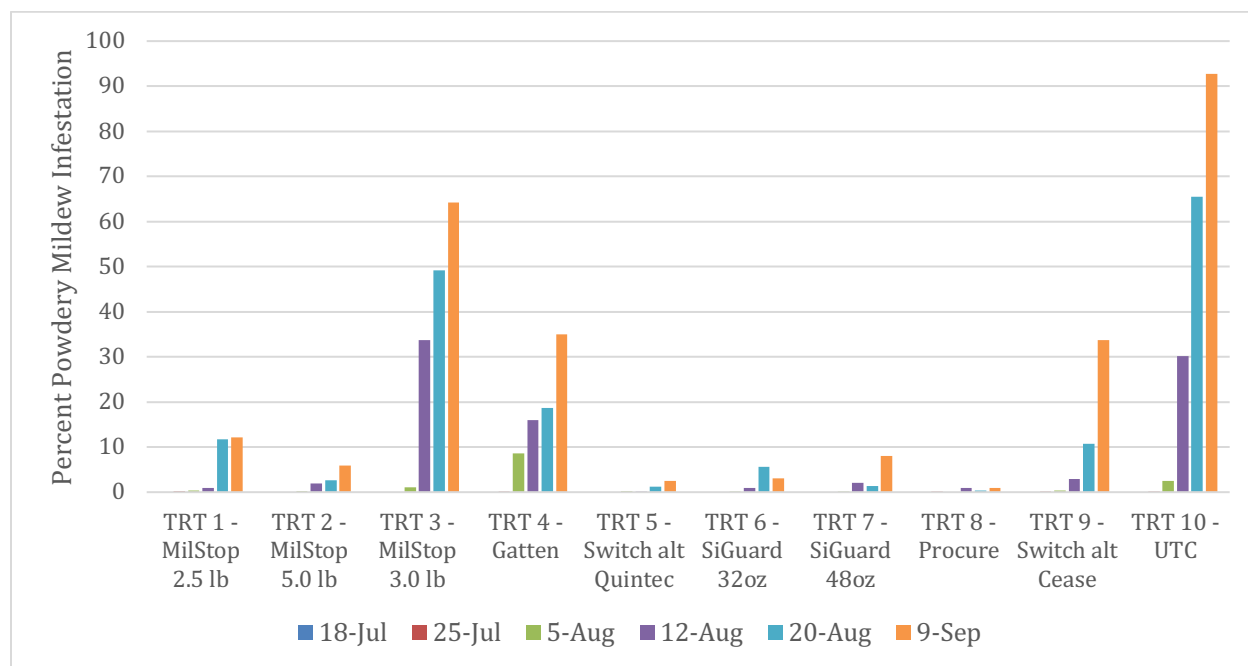
Each treatment plot rating was evaluated using six randomly chosen leaves, inspecting the upper and lower leaf surface for powdery mildew colonies and assigning a percent infestation rating value based on the established pictorial reference guide (**Figure 1**).



**Figure 1.** Percent powdery mildew infection chart.

## Results

Season long powdery mildew infestation mean ratings for each treatment based on lower leaf surface only (Figure 2). Upper leaf surface ratings would show a lower level of PM infestation. Referencing the disease accumulation on the untreated check (TRT 10-UTC), PM was present in mid-July and increased continuously throughout the season.



**Figure 2.** Powdery mildew infestation (%) on the lower leaf surface only from July 18 through September 9. First compound only of treatment is listed in figure unless that compound was used in two or more treatments, then the alternating compound was also listed. See Table 1 for full treatment descriptions.

Treatments 1, 2, 5, 6, 7, and 8 never exceeded 12% PM infestation on the lower leaf surface during the trial while treatments 3, 4 and 9 ranged between 34-64% at peak PM infestation, still offering some control compared to the final rating of 93% for the untreated check (Trt 10).

In addition to percent disease infestation ratings comparing treatment performance over the season, the Area Under the Disease Progress Curve was calculated for each treatment as an accepted method to quantify disease accumulation throughout the season (Table 2).

## Conclusions

Overall, despite the mid to late season dry conditions at the station, PM infestations were slightly depressed initially but then became more normal toward the end of the season in 2024, which is reflected in the ratings.

All treatments were composed of fungicides with 2-4 modes of action (MOAs) that were alternated during the season consistent with recommended FRAC rotation rules to delay the onset of disease resistance (Table 1). In terms of benchmarking efficacy between treatments, TRT 8 would be considered a fairly standard program to compare against other treatments.

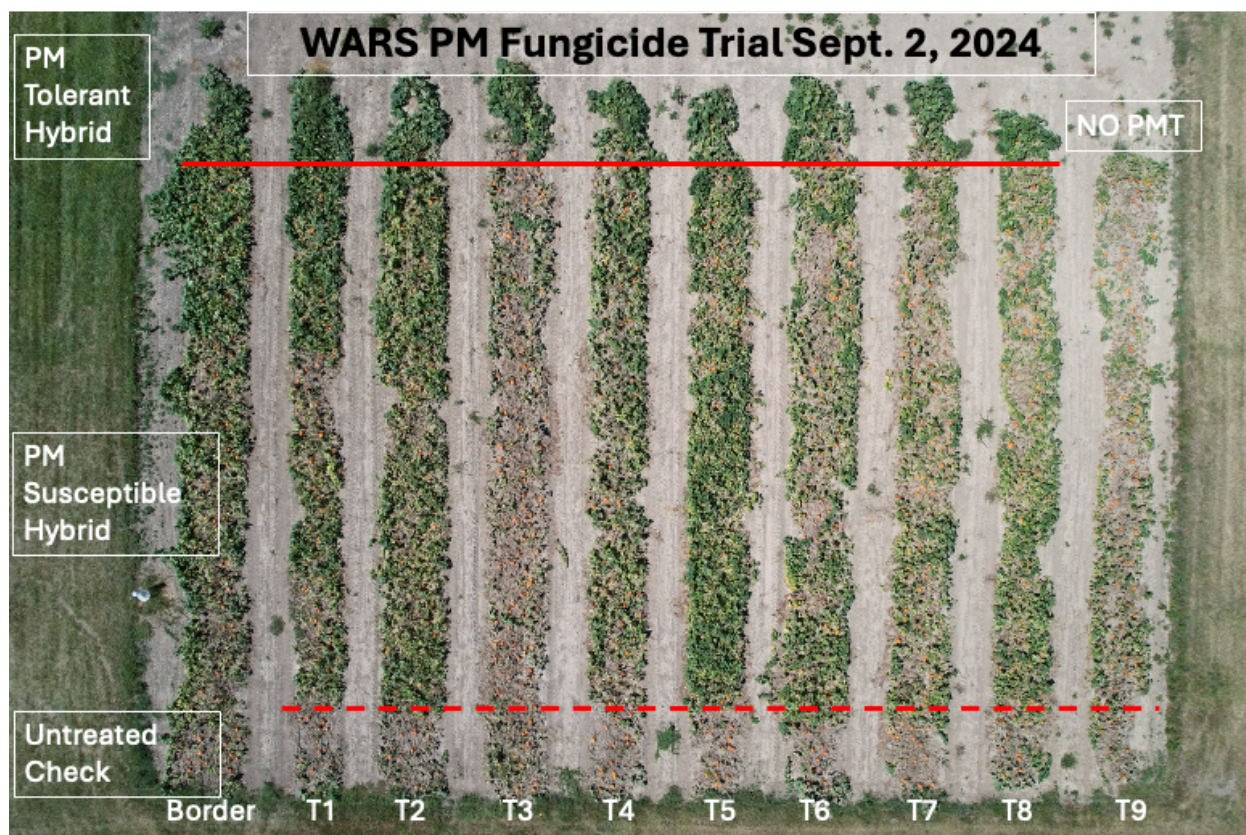
**Table 2.** The Area Under the Disease Progress Curve (AUDPC) for powdery mildew infestation based on lower leaf surface data only between July 18 - September 9. Lower AUDPC values reflect lower overall disease accumulation and higher treatment efficacy.

Treatment	AUDPC	Efficacy Rating '24
TRT 8 – Procure alt. Quintec	21.5	Excellent
TRT 5 - Switch alt. Quintec	44.6	Excellent
TRT 2 - MilStop 5.0 lb alt. Quintec	112.3	Very Good
TRT 7 - SiGuard 48oz alt. Quintec	115.6	Very Good
TRT 6 - SiGuard 32oz alt. Quintec	117.0	Very Good
TRT 1 - MilStop 2.5 lb alt. Quintec	296.4	Good
TRT 9 - Switch alt. Cease	511.6	Good
TRT 4 - Gatten alt. Cease	809.3	Good
TRT 3 - MilStop 3.0 lb alt. Cease	1592.3	Fair-Poor
TRT 10 – Untreated Check (UTC)	2095.1	NA

The nine fungicide treatment programs were broken into five arbitrary categories based on season long efficacy; all outperformed the untreated check. The highest performing treatments (TRT 8 and 5) did an **excellent** job of controlling PM on the upper and lower leaf surface all season long. The next group of treatments (TRTs 2, 7 and 6) were rated **very good** at controlling PM on both leaf surfaces all season. Treatments 1, 9 and 4 were rated **good** at controlling PM on both leaf surfaces. The lowest efficacy treatment was Trt 3, which still provided some PM control compared to the untreated check.

Both Milstop 2.5 and 5.0 lb / A and SiGuard 32oz and 48oz / A treatments performed well while paired with a systemic fungicide. Cease biofungicide was a component in all three of the lowest efficacy treatments (9, 4 and 3) despite being alternated with three different MOAs.

While not part of the formal evaluation process, aerial images of the PM fungicide plots were taken on September 2. These images were not classified into healthy and diseased plant tissue but can be used as a proxy to judge overall plant health, which is not captured in a trial where strictly one disease is rated (Figure 3). The loss of canopy seen in the treatments (1-9) is mainly attributable to PM and a small amount of squash bug damage. No other major diseases were seen in the plots (e.g. Plectosporium, Downy Mildew, Fusarium, Phytophthora, Bacterial leaf spot) to account for the loss of canopy. The top of the photo above the orange line shows the same treatments but sprayed over 2-3 PM tolerant pumpkins (Jack of Hearts) instead of PM susceptible pumpkin. Note how the canopy is much fuller and greener in the PMT hybrid section, showing the true value of using disease resistant hybrids coupled with a reliable fungicide program.



**Figure 3.** Aerial image of powdery mildew fungicide trial at the Western Ag Research Station. Image taken on September 2, 2024.

As you review this report remember this PM fungicide trial was designed as a large plot demonstration to test fungicide efficacy on a susceptible hybrid. There is no randomization and replication, therefore no statistical analysis of these treatments is possible, but these observations may reveal a pattern of efficacy worth future exploration.

If you have any questions about the trial results, please contact me.

Respectfully,

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